

CLAIMS

What is claimed is:

1 1. A method of measuring formation properties, the method comprising:

2 obtaining a first response signal from a first transmitter-receiver array of antenna elements

3 having magnetic dipoles oriented parallel to a tool axis;

4 obtaining a second response signal from a second transmitter-receiver array of elements

5 having magnetic dipoles oriented perpendicular to the tool axis;

6 combining the first and second response signals to obtain a combination response signal

7 having enhanced vertical resolution.

1 2. The method of claim 1, wherein said combining includes:

2 performing a weighted summation of the first and second response signals, wherein the

3 ratio of the weight of the first response signal to the weight of the second response

4 signal is approximately minus three (-3).

1 3. The method of claim 2, wherein the weighted summation is performed in accordance with the
2 following equation:

3
$$\text{Final Response} = a \times \text{VMD response} - b \times \text{HMD response},$$

4 where VMDresponse represents the first response signal, HMD response represents the second
5 response signal, and a and b are optimization parameters.

1 4. The method of claim 1, wherein the first transmitter-receiver array has antenna element
2 placement substantially equal to antenna element placement of the second transmitter-receiver
3 array.

1 5. The method of claim 4, wherein the antenna elements of the first and second transmitter-receiver
2 arrays are appropriately-oriented coils of electrically-conductive material.

1 6. The method of claim 1, further comprising:
2 processing the combination response signal to determine a log of formation resistivity.

1 7. The method of claim 1, further comprising:
2 processing the first response signal to determine a first apparent formation conductivity;
3 processing the combination response signal to determine a second apparent formation
4 conductivity; and
5 combining the first and second apparent formation conductivities to determine a formation
6 anisotropy.

1 8. A logging system that comprises:
2 a multiaxial induction tool configured to provide signals indicative of a vertical magnetic
3 dipole (VMD) response and a horizontal magnetic dipole (HMD) response; and
4 a processor coupled to the multiaxial induction tool and configured to determined a
5 combined response from the VMD and HMD responses, wherein the combined
6 response has a substantially rectilinear vertical measurement profile.

1 9. The system of claim 8, wherein the processor determines the combined response as a weighted
2 sum of the VMD response and the HMD response, and wherein the relative weights of the VMD
3 and HMD responses are $3/2$ and $-1/2$, respectively.

1 10. The system of claim 8, wherein the processor is further configured to determine a resistivity log
2 of a formation from a combined response determined as the induction tool is moved through a
3 borehole.

1 11. The system of claim 8, wherein the multiaxial induction tool includes at least one transmitter
2 triad and at least two receiver triads.

1 12. The system of claim 8, wherein the processor is further configured to determine a formation
2 resistivity anisotropy from the combined response and the VMD response.